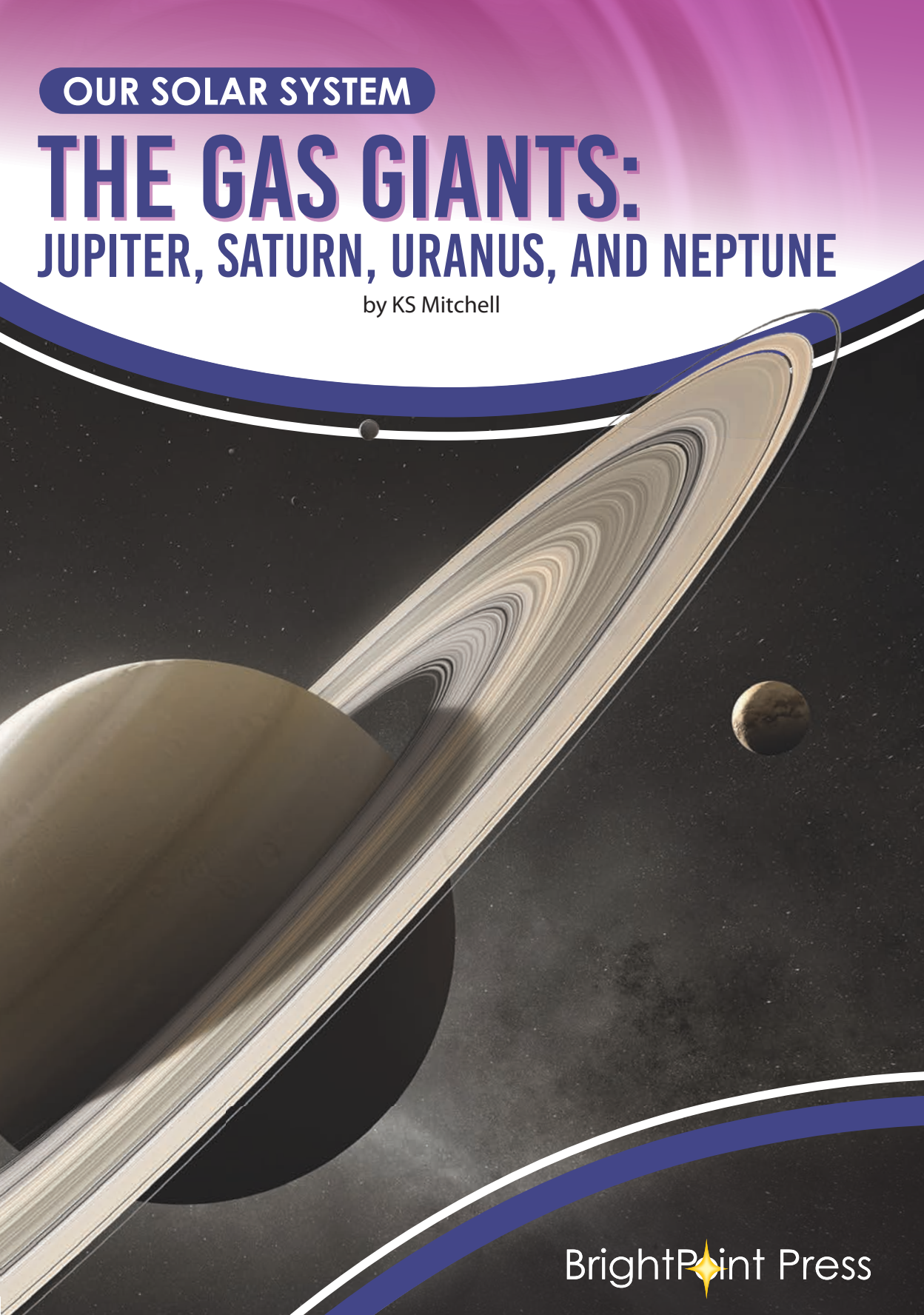
OUR SOLAR SYSTEM

THE GAS GIANTS: JUPITER, SATURN, URANUS, AND NEPTUNE

by KS Mitchell



BrightPoint Press

CONTENTS

AT A GLANCE

- The solar system formed from a giant, spinning cloud of gas and dust.
- The planets closest to the Sun are made of rock. The planets farthest from the Sun are made of gas.
- The four planets farthest from the Sun are called the gas giants. They are Jupiter, Saturn, Uranus, and Neptune.
- The gas giants have much in common. They are made of swirling gases, including hydrogen and helium. They have no solid surfaces for spacecraft to land on. They are larger than the solar system's inner rocky planets.
- Only a few space probes have visited the outer planets. *Pioneer 10* and *Pioneer 11* traveled to the gas giants. So did *Voyager 1* and *Voyager 2*. *Galileo* and *Juno* traveled to Jupiter, and *Cassini* visited Saturn.

4

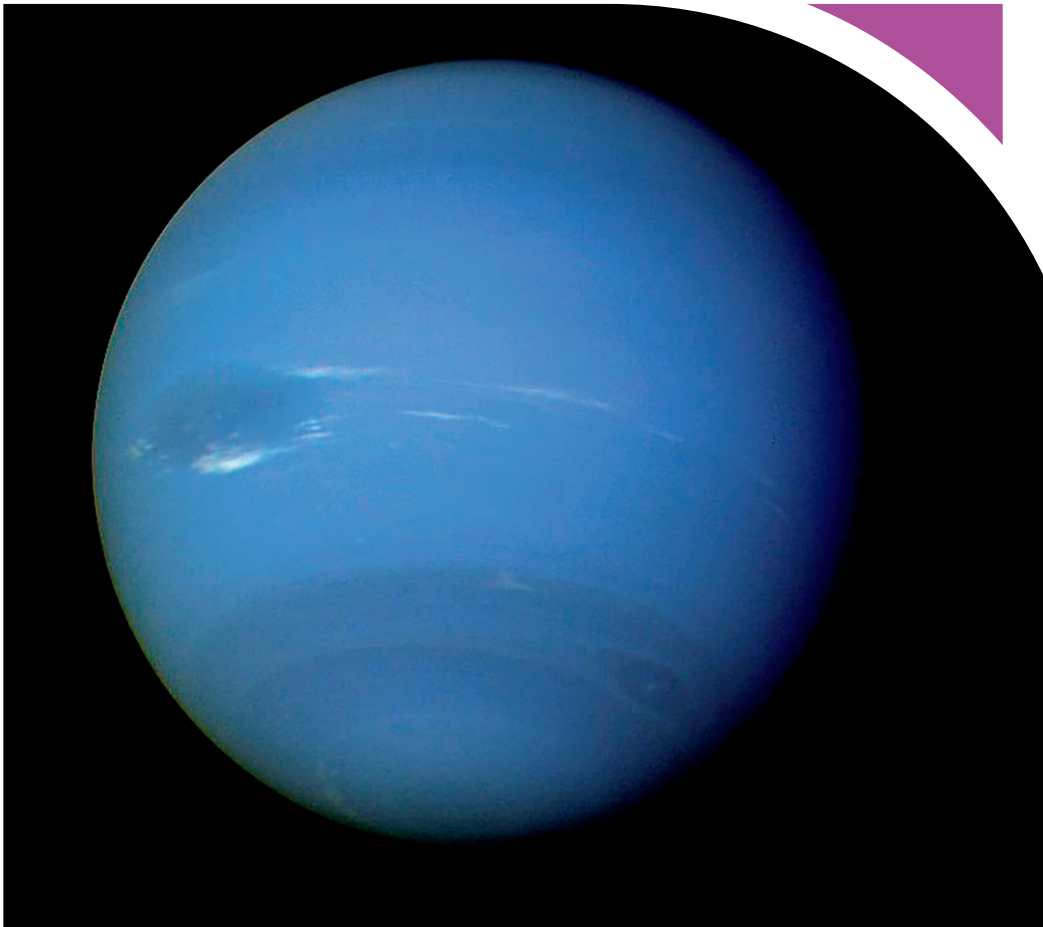
NEPTUNE

Neptune is the most distant planet in the solar system. It is about 30.1 AU from the Sun. Neptune can't be seen from Earth without a telescope, so ancient people didn't know of its existence.

Neptune was discovered in 1846. It was the first planet discovered using math.

Scientists realized the motion of Uranus was affected by the gravity of another planet. They used math to figure out where this new planet must be. When they looked in this spot, they found Neptune.

Voyager 2 captured the only close-up photos of Neptune ever taken.



This makes it the fourth-largest planet, just behind Uranus. It's about four times wider than Earth.

BENEATH THE BLUE EXTERIOR

Neptune shares many characteristics with Uranus. They are often called ice giants instead of gas giants because they are made up of icy materials rather than gases. The planet's blue tint comes from traces of methane gas in the atmosphere.

Neptune is the windiest planet in our solar system, outdoing even Jupiter and its Great Red Spot. Winds on Neptune reach

Voyager 2 spotted an enormous storm raging through Neptune's atmosphere.

up to 1,200 miles per hour (2,000 kmh). However, the storms don't last as long as those on Jupiter. When *Voyager 2* visited Neptune in 1989, it captured images of a storm scientists called the Great Dark Spot. When the Hubble Space Telescope took pictures in 1991, the storm had disappeared. In 2015, scientists spotted

GAS GIANT PROPERTIES

	Radius	Length of Day	Length of Year	Average Distance from Sun
Jupiter	43,000 miles (70,000 km)	10 Earth hours	12 Earth years	480 million miles (780 million km)
Saturn	36,000 miles (58,000 km)	10.7 Earth hours	29 Earth years	890 million miles (1.4 billion km)
Uranus	15,800 miles (25,400 km)	17 Earth hours	84 Earth years	1.8 billion miles (2.9 billion km)
Neptune	15,300 miles (24,600 km)	16 Earth hours	165 Earth years	2.8 billion miles (4.5 billion km)

Source: "Solar System Exploration," NASA, n.d. https://solarsystem.nasa.gov.

another giant storm forming on the planet. This suggested that large storms continuously come and go.

Neptune is denser than the other three gas giants. Still, its density is far lower than that of the solid Earth. Its density comes

of Neptune's rings. It also sent back pictures of ring arcs. These are particles of debris clumped together near the outermost ring. The arcs form partial rings.

WHERE IS *VOYAGER 2* NOW?

Voyager 2 is the only spacecraft to visit all four gas giant planets. After Neptune, it continued its journey toward the edge of the solar system. In 1998, most of its equipment was turned off to save power. In 2018, *Voyager 2* passed out of the solar system. It continued to send back information to Earth. It is so far away, signals take twenty-one hours to reach Earth. "I never in my wildest dreams thought that I would still be working on *Voyager* fifty years after we wrote the proposal," says *Voyager* researcher Stamatios Krimigis.

Quoted in Ken Croswell, "Voyager Still Breaking Barriers Decades After Launch," Proceedings of the National Academy of Sciences*, April 27, 2021. https://pnas.org.*

GLOSSARY

atmosphere

the layer of gases that surrounds a planet or star

core

the central part of a celestial body such as a star or planet

gravity

the natural force that causes physical things to move toward each other

magnetic field

for a planet, the magnetic influence created by the movement of magnetic material located inside the planet

retrograde

moving backward

scattering

when moving particles or waves are forced out of a straight path

trajectory

the path taken by a moving object in space

SOURCE NOTES

CHAPTER ONE: JUPITER

1. Quoted in "Io's Magma Ocean Provides a View into Earth's Past," *Physics Today*, June 29, 2011. https://physicstoday.scitation.org.

2. Quoted in "NASA's Juno: Science Results Offer First 3D View of Jupiter Atmosphere," *Mission Juno*, October 28, 2021. https://missionjuno.swri.edu.

CHAPTER TWO: SATURN

3. James Green, "What Did We Learn from the Voyager Mission?" *BBC Sky at Night*, August 11, 2020. www.skyatnightmagazine.com.

4. Quoted in "NASA's Dragonfly Will Fly Around Titan Looking for Origins, Signs of Life," *NASA*, June 27, 2019. www.nasa.gov.

CHAPTER THREE: URANUS

5. Quoted in Kimberly M. S. Cartier, "Uranus and Neptune Should Be Top Priority, Says Report," *Eos*, December 14, 2018. www.eos.org.

6. Quoted in "The Science Case for an Orbital Mission to Uranus," *Planetary and Space Science*, August 7, 2014. https://orbi.uliege.be.

CHAPTER FOUR: NEPTUNE

7. Quoted in Daniel Oberhaus, "Neptune Is a Windy, Chilly, and Baffling Planet. Let's Go!" *Wired*, June 17, 2019. www.wired.com.

FOR FURTHER RESEARCH

BOOKS

David Aguilar, *Space Encyclopedia, 2nd Edition: A Tour of Our Solar System and Beyond*. Washington, DC: National Geographic Kids, 2020.

Margaret J. Goldstein, *Discover Jupiter.* Minneapolis, MN: Lerner, 2018.

Lisa Reichley. *Our Solar System: An Exploration of Planets, Moons, Asteroids, and Other Mysteries of Space.* Emeryville, CA: Rockridge Press, 2020.

INTERNET SOURCES

"Jupiter's Great Red Spot Storm Is Much Deeper Than Expected," *KidsNews*, November 1, 2021. https://kidsnews.com.au.

"Saturn, Planet of Rings, Moons and More to Explore," *Planetary Society*, 2022. https://planetary.org.

Carolyn Wilke, "Scientists Say: Gas Giant," *Science News for Students*, February 24, 2020. https://sciencenewsforstudents.org.

INDEX